IMRAA.013V1

PATENT

#11 Appeal Brief 7/10/02 J.M.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	:	Jiang, et al.	Group Art Unit 2881
Appl. No.	:	09/738,372	
Filed	:	December 15, 2000	
For	:	RESONANT FABRY-PEROT SEMICONDUCTOR SATURABLE ABSORBERS AND TWO PHOTON ABSORPTION POWER LIMITERS	
Examiner	:	Jeffrey Zahn	

ON APPEAL TO THE BOARD OF PATENT APPEALS AND INTERFERENCES
APPLICANT'S BRIEF

Assistant Commissioner for Patents
Washington, D.C. 20231

Dear Sir:

This appeal brief is filed in triplicate. A check in the amount of $710 is included to cover the fee for filing the appeal brief pursuant to 35 C.F.R. 1.17(f). Please charge any additional fees which may be required to Deposit Account No. 11-1410.

STATEMENT OF INTEREST

Pursuant to 37 C.F.R. 1.192(c)(1), Applicants hereby notify the Board of Patent Appeals and Interferences that Imra America, Inc., 1044 Woodridge Avenue, Ann Arbor, Michigan 48105, is the real party of interest.

RELATED CONCURRENT APPEAL

This application shares the identical specification as Application No. 09/738,373. In addition, the rejections being appealed are identical; they are under the same provisions and

relate to the same issues. Clearly, decisions in either of these cases may have a bearing on the decision in the other.

REQUEST FOR CONSOLIDATED ORAL HEARING

Applicant petitions the Board of Appeals and Interferences to consolidate the appeal hearings for Application No. 09/738,372 and Application No. 09/738,373. These two cases share a specification and the rejections being appealed are identical. Consolidating these appeals for the oral hearing will conserve the time of the Board and will reduce the cost for the Assignee.

STATUS OF THE CLAIMS AND AMENDMENTS

This application is a joint application of Jiang, Harter, Sucha and Fermann. Along with another application, Serial Number 09/738,373, this application is a divisional application of Serial Number 09/149,368, filed on September 8, 1998, now issued as Patent Number 6,252,892.

Claims 22-28 and 33-34 are pending and are the subject of this appeal.

Claims 22-28 and 33-34 were the subject of a final rejection mailed on December 19, 2001.

SUMMARY OF THE INVENTION

The present invention is a method of achieving self-starting continuous wave ("cw") mode-locking evolving from Q-switched mode-locking (QSML). In contrast, the modelocking of most solid state lasers begins from cw noise. Modelocking is one of the most important modes of operation for a laser. When a laser is mode-locked, the optical energy is compressed into a very short pulse of about a few picoseconds. Q-switching is a means of obtaining short intense pulses from lasers. The Q-switch inhibits lasing until a very large inverted population of excited atoms builds up. However, if the application requires a continuous wave, persistent Q-switching would be troublesome.

In addition, this invention may include the use of interactivity Resonant Fabry-Perot Absorbers (R-FPSA) for inducing self-starting mode-locking in a laser. An optical power limiter such as a two photon absorber (TPA), e.g., a semiconductor material, is optionally used in the laser cavity to inhibit Q-switching. The R-FPSA may be designed such that the nonlinear loss experienced by the saturable absorber is enhanced over the prior art Anti-resonant Fabry-Perot saturable absorber (A-FPSA) configurations. The TPA power limiter provides effective damage

protection for the R-FPSA and self-adjusts the total nonlinear loss of the laser to be in the stable cw mode-locking region. The suppression of Q-switching leads to laser output that is cw modelocked.

Prior to this invention, semiconductor saturable absorbers have found application in the field of passively modelocked, ultrashort pulse lasers. These devices are attractive since they are compact, inexpensive, and can be tailored to a wide range of laser wavelengths and pulsewidths.

Prior to this invention, a method of generating cw mode-locked laser pulses with Q-switching suppression was not known. Thus, this invention is the first method of generating cw mode-locked laser pulses which generates Q-switched mode-locked laser pulses and then suppresses the Q-switching.

The R-FPSA may include two reflectors having a defined spacing. One reflector is preferably a maximum reflector that defines one end of the laser cavity (the "end reflector"), whereas the other reflector is formed by a high or partial reflector that faces the gain medium of the laser (the "inner reflector").

When the Fabry-Perot device has a defined thickness leading to a double pass phase change equaling $\delta=(2m+1)\pi$, where m is a positive integer, the Fabry-Perot structure is said to be at resonance. In this case, the fraction of the intercavity power that is reflected from the saturable absorber($R_{F\text{-}P}$) is a minimum. By operating at resonance, the laser intensity absorbed by the saturable absorber is enhanced. By operating the Fabry-Perot device at resonance, the intensity absorbed by the saturable absorber is increased by a substantial factor.

The effect of varying R on $R_{F\text{-}P}(\lambda)$ for an R-FPSA is illustrated in FIGURE 2 of the application. The spacing between adjacent minima is preferably large for certain applications such as ultrafast lasers, where broad bandwidth is needed. The inner reflector should have a reflectivity R sufficiently high to provide a desired intensity on the saturable absorber. This reflectivity R, however, should not be so high that $R_{F\text{-}P}(\lambda)$ is no longer relatively flat over the gain profile. For example, if the inner reflector reflectivity R is too high, the bandwidth of $R_{F\text{-}P}(\lambda)$ at resonance needed for modelocked laser pulses may be too limited. For applications in which the spot size on the saturable absorber can not be varied (e.g., butt-coupling to a fiber or a waveguide), "tuning" the intensity on the absorber by selecting an appropriate R may be desirable.

The resonant effect on the nonlinear loss and $R_{F\text{-}P}$ as a function of wavelength is explored in FIGURE 3 of the application. This figure shows that the nonlinear loss experiences a significant

enhancement when the Fabry-Perot device is designed to be at resonance. It can be seen by using the appropriate equation that the nonlinear loss at resonant (near 1540 nm) is 7 times larger than that at anti-resonance.

In one preferred embodiment, the gain medium is an erbium doped fiber having an upper state lifetime on the order of milliseconds (ms), and the round trip cavity time is typically 10-100 nsec. By using an R-FPSA with a large nonlinear loss, the fiber laser may operate in a QSML regime rather than a cw modelocked regime. In this case, it may be necessary to suppress the intense Q-switched pulses, thereby driving the laser below threshold. In a preferred embodiment of this invention, a two photon absorber (TPA) is used for this purpose to complement the R-FPSA, so that the laser operates in a cw modelocked regime. The TPA preferably has little or no single photon absorption at the laser wavelength. Thus, two different types of absorbers, having different nonlinear behavior, may be used in the same device to achieve self-starting, cw modelocked behavior.

The different intensity dependencies of a preferred saturable absorber (InGaAsP) and a preferred two photon absorber (InP) are illustrated in FIGURE 4 of the application. The loss due to the two photon absorber increases strongly as a function of intensity, whereas the loss due to the saturable absorber decreases (saturates) with increasing intensity. The resultant "V-shaped" total loss of FIGURE 4 has a minimum which is a favorable regime for cw modelocking.

The optical limiter (e.g., the TPA) preferably has a large two photon absorption coefficient β_2, which is a function of the ratio of the material's band gap E_g and the photon energy (see, for example, E. W. Van Stryland, M. A. Woodall, H. Vanherzeele, and M. J. Soileau, "Energy band-gap dependence of two-photon absorption," Opt. Lett., 10, 490, 1985). FIGURE 5 of the application shows how the two photon coefficient scales with this ratio. For a given laser wavelength, the band gap E_g of the optical power limiter may be larger than the photon energy , so that maximum two photon absorption can be obtained without significant increase in the insertion loss, *l*. The band gap can be easily controlled by proper choice of the semiconductor material and/or its doping levels.

The TPA is effective at suppressing QSML regardless of its position in the laser cavity. For example, the TPA may adjoin the saturable absorber. Alternatively, the TPA and the saturable

absorber may be located on opposite sides of the gain medium, or several TPAs may be used to reduce the thickness of the Fabry-Perot device, thereby offering greater design flexibility.

Suppression of Q-switched pulses by two photon absorbers has been previously reported (see, for example, A. Hordvik, "Pulse stretching utilizing two-photon-induced light absorption", J. of Quantum Electronics, QE-6, 199 (1970) and V.A. Arsen'ev, I. N. Matveev, and N. D. Ustinov, "Nanosecond and microsecond pulse generation in solid-state lasers (review)", Sov. J. Quantum Electron, vol. 7 (11), 1321 (1978)). Also, semiconductor-based two photon absorbers have been used as optical power limiters to protect damage sensitive optics (see, for example, US patent 4,846,561 to Soileau et al.).

The band gap of a two photon absorber lies well above the photon energy at the laser wavelength, so that single photon absorption is low at low intensities. At higher intensities, however, the production rate of carriers generated from the valance band to the conduction band increases.

A two photon absorber tends to limit the pulse shortening of high intensity pulses, since pulse peaks are more strongly attenuated than the wings. Thus, the conventional understanding of the two photon absorption effect is that it degrades the performance of modelocked lasers (see, for example, A. T. Obeidat and W. H. Knox, "Effects of two-photon absorption in saturable Bragg reflectors in femtosecond solid-state lasers", OSA Technical Digest, 11, 130, Proceedings of CLEO' 97). In the high gain fiber laser disclosed herein, however, Q-switched modelocking is the main impediment to cw modelocking. Thus, by suppressing QSML, this invention facilitates cw modelocking.

The combination of the R-FPSA and the TPA optical limiter disclosed in the application provides one arrangement for self-starting modelocking, since the R-FPSA provides quick pulse shortening due to its large saturable loss, and the optical limiter self adjusts the nonlinear loss to be within the cw modelocking stability region (FIGURE 4 in the appplication). The TPA power limiter also provides effective damage protection for the saturable absorber. The intensity on the saturable absorber can be optimized by varying the spot size on the absorber, or by selecting R appropriately.

ISSUES PRESENTED ON APPEAL

ISSUE 1: Whether claims 22-28, and 33-34 omit essential steps, with such steps amounting to a gap between the steps sufficient to cause final rejection under 35 U.S.C. 112, second paragraph.

ISSUE 2: Whether the preamble language "generating CW mode-locked laser pulses" in Claims 22 and 33 and the preamble language "generating cw mode-locked laser energy" in Claims 28 and 34 should be given patentable weight.

ISSUE 3: Whether Claims 22-28 and 33-34 are obvious in view of the combination of Jacobovitz-Veselka et al. (U.S. Patent 5,278,855) in view of Hordvik.

GROUPING OF THE CLAIMS

In Applicants' opinion, Claims 22-27 may be grouped together as a first group for purposes of this appeal.

Claim 28 stands alone for the purposes of this appeal.

Claim 33 also stands alone for the purposes of this appeal.

Finally, Claim 34 stands alone for the purposes of this appeal.

DISCUSSION OF THE REFERENCES RELIED UPON BY THE EXAMINER

THE JACOBOVITZ-VESELKA REFERENCE

One of the Examiner's references is the Jacobovitz-Veselka, et al. patent. This is the patent 5,278,855 entitled "Broadband Semiconductor Saturable Absorber" (Hereafter " '855 patent"). The '855 patent, issued in Jan 1994, discloses a method of generating mode-locked Q-switched pulses. While the '855 patent does disclose the use of saturable absorbers in that method, it does not disclose the suppression of Q-switching. In order to achieve cw mode-locking in accordance with the claims at issue, repetitive Q-switching is suppressed..

THE HORDVIK REFERENCE

The Hordvick reference(A. Hordvick, "Pulse stretching utilizing two-photon-induced light absorption", J. of Quantum Electronics, QE-6, 199 (1970)) discusses the experimental possibilities of Q-switching absorption. The Examiner argues that Hordvick teaches the suppression of Q-switching, however, the article only discusses the reduction of Q-switching in order to generate pulse stretched lasers. Hordvick teaches only a Q-switched laser with stretched pulses, not a cw laser in which the cw mode-locked energy is generated from Q-switched mode-locked pulses. While Hordvick reaches the doorstep of the invention in this application, Hordvick clearly does not teach the suppression of Q-switching to generate cw pulses.

ARGUMENT

35 U.S.C. § 112 REJECTIONS

The Examiner rejected all of the claims as "omitting essential steps," citing MPEP §2172.01. The Examiner listed the "omitted steps" as 1) pumping a gain medium within a resonant Fabry-Perot laser cavity; 2) generating Q-switched mode-locked laser pulses using a saturable absorber located within said resonant Fabry-Perot optical cavity; 3) absorbing said Q-switched laser pulses by insertion of a two-photon absorber within the said resonant Fabry-Perot optical cavity; and 4) outputting a cw mode-locked laser pulse from the said resonant Fabry-Perot optical cavity.

MPEP § 2172.01 states:

> "A claim which omits matter disclosed to be essential to the invention as described in the specification, or in other statements of record may be rejected under 35 U.S.C. 112, first paragraph, as not enabling. *In re Mayhew,* 527 F.2d 1229, 188 USPQ 356 (CCPA 1976). See also MPEP 2164.08(c). Such essential matter may include missing elements, steps or necessary structural cooperative relationships of elements described by the applicant(s) as necessary to practice the invention.
>
> "In addition, a claim which fails to interrelate essential elements of the invention as defined by applicant(s) in the specification may be rejected under 35 U.S.C. 112, second paragraph , for failure to point out and distinctly claim the

invention See *In re Venezia,* 530 F.2d 956, 189 USPQ 149 (CCPA 1976); *In re Collier*, 397 F.2d 1003, 158 USPQ 266 (CCPA 1968)." **(emphasis added)**

Under the language of MPEP 2172.01, as emphasized above, the applicant is only obliged to claim elements that were defined to be essential in the specification or in other statements of record. Applicants did not disclose in the specification, or in any other statement of record, that these steps were "essential." In *Mayhew*, the court ruled one step to be essential. There the court pointed to specific language of importance. "Appellant's specification states that the 'strip...and bath...are raised in temperature above what is ordinarily considered optimum coating temperatures. This is practicable because of special cooling apparatus, specially located.'" *Mayhew*, 527 F.2d at 1233. The above language of the application in that case made it clear that the element was essential to the invention. In the application at bar, there was no such language regarding any of the elements the Examiner regards as omitted essential elements. It is noteworthy that a second group of claims in the *Mayhew* patent were also rejected because of omission of an essential element, namely the specific temperature and functions of the cooling zone. The *Mayhew* court overturned this second rejection of claims. The court reasoned that a person of ordinary skill in the art could determine the appropriate temperature and functions for the cooling zone based on the specification and particular uses with the patented process. *Mayhew,* 527 F.2d at 1233-1234.

A similar rationale should be applied to this application. The overarching essential steps are those steps that a person of ordinary skill would not do. Here, those steps are the suppression of Q-switching to generate cw mode-locked laser pulses. That is the new step that was introduced by these inventors, and that is what is claimed by the application. The alleged omitted essential steps are steps that anyone of ordinary skill in the art would recognize. First, those of ordinary skill would know that many lasers have a gain medium in the laser cavity, and would know how to build the same. The next two "omitted" elements go to the generation and suppression of Q-switching. Q-switching is a topic that has been covered a lot in both scholarly work and patents, and the generation of Q-switched laser pulses is something that a person of ordinary skill could accomplish in a number of ways. See, for example, Kajava, et. al. "Q-switching of a diode-pumped Nd:YaG laser with GaAs," Optics Letters, Vol. 21, No. 16, August 15, 1996, pgs. 1244-1246; Everett, "Laser mode locking, Q-switching and dumping system,"

Patent number 4,375,684 (1983). The suppression of Q-switching is taught by one of the references the Examiner cites, the Hordvick reference. While there may be several other ways to accomplish this task, the fact that one of these methods is clearly prior art should be sufficient to ensure that this task could be accomplished by a person of ordinary skill in the art. Finally, the Examiner argues that "outputting a cw mode-locked laser pulse from the said resonant Fabry-Perot optical cavity" is another omitted essential element. Output of a laser pulse from within the optical cavity, once such a pulse is generated, is a topic that is surely understood by anybody of ordinary skill in the field. See, for example, Ichinose, et. al., "High power multibeam laser", Patent number 3,943,461 (1976). All of these "essential" elements are steps that are known to persons of ordinary skill in the art and are possible features of the invention claimed here, but they are not essential to the invention. In sum, the "essential" elements that were used to reject claims are comparable to the temperature and function rejections in *In re Mayhew*, and like those rejections, should be overturned.

In addition, the long-term viability of the *In re Mayhew* decision's "essential elements" ground is not clear. The case is rarely cited for this principle, and the cases on which the majority relies do not clearly support the decision. The majority cites only five cases, all of which overturn at least some of the original §112 indefiniteness rejections. *In re Borkowski*, 422 F.2d 904, 164 USPQ 642 (1970); *In re Moore*, 439 F.2d 1232, 169 USPQ 236 (1971); *In re Sarett*, 327 F.2d 1005, 140 U.S.P.Q. 474 (1964); *In re Corr*, 347 F.2d 578, 146 U.S.P.Q. 69 (1965); *In re Honn*, 364 F.2d 454, 150 U.S.P.Q. 652 (1966). In *Moore,* the court explained how a claim must be interpreted for definiteness:

> "This first inquiry therefore is merely to determine whether the claims do, in fact, set out and circumscribe a particular area with a reasonable degree of precision and particularity. It is here where the definiteness of the language employed must be analyzed - not in a vacuum, but always in light of the teachings of the prior art and of the particular application disclosure as it would be interpreted by one possessing the ordinary level of skill in the pertinent art." *Moore,* 439 F.2d at 1235.

This test does not clearly support the rule in *Mayhew*, as applied by the Examiner. Indeed, *Mayhew* seems to decide the case on a rule that the precedents cited do not clearly support.

In *Microsoft v Reiffin,* 214 F.3d 1342; 54 U.S.P.Q.2D (BNA) 1915, ha Federal Circuit panel avoided the question of whether there is such an "essential element" test and decided the case on other grounds. See also, Donald S. Chisum, 6 Chisum on Patents § 7.04[2] (2001). However, in concurrence, Judge Newman felt that the question was ripe in the case and that the validity of the "omitted element" test was questionable. As Judge Newman stated:

> "The district court accepted Microsoft's proposition that the patentee must include in every claim "each and every element" that was described as "part of his invention," whether or not the element is necessary for patentability of the claim. Failure to do so, the district court held, invalidates the claims for noncompliance with the written description requirement of § 112 P[aragraph] 1. That is not a correct statement of the law. Section 112 P[aragraph]2 instructs the applicant to "distinctly claim[] the subject matter which the applicant regards as his invention". This does not automatically require inclusion in every claim of every element that is part of the device or its operation." *Microsoft*, 214 F.3d at 1347.

The "omitted element" test is based on questionable precedents and unclear decisions. Other cases that have been used to support the test do not really go to the question of whether every element of an invention needs to be claimed. For example, Microsoft cited *Gentry Gallery, Inc. v. Berkline Corp.,* 134 F.3d 1473, 45 U.S.P.Q.2d (BNA) 1498 (Fed. Cir. 1998) in order to support their contention that all elements of an invention need to be claimed. *Microsoft*, 214 F.3d at 1347 (Newman, J. concurring.). However, this case merely states the oft-stated proposition that claims that are broader than the application's disclosure will not be allowed. *Id.* And, finally, cases have stated the proposition that there is, at least with respect to combination patents, no "essential" element. *Aro Mfg. Co. v. Convertible Top Replacement Co.*, 365 U.S. 336, 345, 128 U.S.P.Q. (BNA) 354 (1961) ("[T]here is no legally recognizable or protected "essential" element, "gist" or "heart" of the invention in a combination patent.")

In summary, though the validity of the "omitted" or "essential" element test are of questionable legal value, the application at bar does not even fit the test. The application discloses more than enough information to allow one of ordinary skill in the art to practice the invention. The elements omitted from the claims are only ways to accomplish various required steps of the invention. Given the language of the MPEP section, and the cases cited, the present

claims do not fall within the category of applications to be rejected based upon omitted essential elements. Applicants believe that this rejection should be reversed.

35 U.S.C. § 103 REJECTIONS

The Examiner rejected claims 22-26, 28, and 33-34 as obvious in view of Jacobitz-Veselka et al. combined with Hordvick. As discussed above, the '855 patent discloses a method of generating mode-locked Q-switched pulses, but lacks the step of suppressing Q-switching. Hordvick teaches the suppression of Q-switching in order to generate pulse-stretched laser pulses. However, neither reference, either separately or in combination with the other, teaches "A method of generating cw mode-locked laser pulses." Every claim in this application is related to this generation of cw mode-locked laser pulses or energy.

However, the Examiner has refused to give patentable weight to the claim preamble words "A method of generating cw mode-locked laser pulses" and "A method of generating cw mode-locked laser energy." Examiner bases this refusal on *In re Hirao*, 535 F.2d 67, 190 USPQ. 15 (CCPA 1976) and *Kropa v Robie*, 187 F.2d 150, 88 USPQ. 478 (CCPA 1951). However, these cases are neither clear nor determinative. In fact, *Kropa* has been read by the Federal Circuit to underscore the importance of the claim preamble.

> If the claim preamble, when read in the context of the entire claim, recites limitations of the claim, or, if the claim preamble is `necessary to give life, meaning, and vitality' to the claim, then the claim preamble should be construed as if in the balance of the claim. ... Indeed, when discussing the `claim' in such a circumstance, there is no meaningful distinction to be drawn between the claim preamble and the rest of the claim, for only together do they comprise the `claim'." *Pitney Bowes, Inc v. Hewlett-Packard Co*, 182 F.3d 1298, 1305, 51 USPQ.2d 1161, 1165-66 (Fed. Cir. 1999) citing *Kropa*, 187 F.2d at 152, 88 USPQ at 480-81.

Other cases have pointed out that the claim preamble should be considered when evaluating obviousness over a prior art reference. *In re Stencel,* 828 F.2d 751, 4 U.S.P.Q.2d 1071 (Fed. Cir. 1987); *In re Duva,* 387 F.2d 402, 407, 156 U.S.P.Q. 90 (CCPA 1967); *In re Walles,* 366 F.2d 786, 790, 151 U.S.P.Q. 185 (CCPA 1966). A similar type of patent claim was at issue in *Wales*. There, the preamble in question said, "A composition for setting hair comprising a ring substituted N-vinyl-z-oxazolidinone polymer of the structural formula:" *Walles*, 366 F.2d at 788.

The examiner in that case argued that the words "for setting hair," carried no patentable weight. However, the Court of Claims and Patent Appeals rejected this argument.

> [W]e do not agree that the portion of the patent claims which recite "a composition for setting hair," may be ignored in determining what invention is defined by the patent claims. An examination of the patent specification, including the objects of the invention, the discussion of the prior art, and the examples set forth, reveals that it is directed solely to compositions for setting hair. The only interpretation of the patent claims consistent with the disclosure is that the invention, the subject matter claimed therein, is a hair setting composition. *Walles*, 366 F.2d at 716-17.

Throughout this application, the invention is referred to as a method of generating mode-locked laser energy or pulses, specifically cw mode-locked laser energy. In the field of invention statement, the invention is related "generally to modelocking, and in particular, to cw mode-locking...". Application at page 1, line 1-2. In the Description of the Related Art section of the application, saturable absorbers are discussed within the context of being modelocking elements. See, for example, application at page 2, line 14. In the Drawings, an emphasis is placed on cw mode-locking. See, for example, Figure 11. In the Detailed Description of the Preferred Embodiment section, the invention is clearly defined as relating to cw mode-locked lasers through statements like, "In several preferred embodiments of this invention, self-starting cw mode-locking is obtained from Q-switched mode-locking." Application at page 10, line 31-32. The fact that this invention relates to cw mode-locked lasers is obvious from the application. To read the claims giving no patentable weight to the "cw mode-locked laser" language in the preamble is to read the claims with no regard to the specification or any of the rest of the application. Clearly, this is not proper claim interpretation. *Walles*, 366 F.2d at 790. ("We do not agree that the patent claims before us can be interpreted [without looking at the claim preamble in light of the facts of the application] ... nor is such a method of analysis proper in determining whether two sets of claims are 'patentably indistinct.'")

In this application, the claim preamble is "necessary to give life, meaning, and vitality" to the claim.. The preamble is more than a mere intended use; it is a limitation on the claims. The effect of these words distinguishes the invention from the prior art and limits the claims. If the claims are read in the context of the entire patent application, it is clear that the preamble

language is meant to limit the claims. In addition, the fact that these words appear in the preamble as compared to the body of the claim is really a matter of little import. The claims could easily be amended to correct this issue; the language would simply have to be moved into the body of the claim. However, the risk and potential cost of this change could be high given the unclear state of prosecution history estoppel law. See *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.*, 535 U.S. ___, 122 S. Ct. 1831 (2002). Considering that the language was already in the claim, this is a risk that the applicant should not face. The preamble language must be given patentable weight and should be used to define the invention for obviousness purposes.

The combination of the two references do not make the claims obvious. Neither separately nor in combination does the prior art disclose a method of generating cw mode-locked laser pulses with suppression of Q-switching. In fact, neither of the references that the examiner uses to reject the patent claims on obviousness even discuss cw mode-locked lasers. As discussed above, the Hordvick reference discusses stretching pulses with the suppression of Q-switching, but that article does not provide cw mode-locking. The fact that it took so long for anybody to take the next step, a cw mode-locked laser, is further evidence that the invention of this application is not obvious. The development of this invention is not obvious, and therefore should not be rejected under 35 U.S.C. §103. Applicants believe that this rejection should be reversed.

Finally, Claim 27 was rejected under the rule of *In re Aller*, 220 F.2d 454, 105 USPQ. 233. In that case, "the court set out the rule that the discovery of an optimum value of a variable in a known process is normally obvious." *In re Antonie,* 559 F.2d 618, 620, 195 USPQ 6, 8 (CCPA 1977). However, once the preamble language, "A method of generating cw mode-locked laser pulses" in Claim 22 is given patentable weight, the process in no longer a "known process". Applicants believe that this rejection should be reversed.

REQUEST FOR ORAL HEARING

Applicant hereby requests an Oral Hearing in this Appeal.

CONCLUSION

Applicants submit that the claims of this application are allowable.

Respectfully submitted,

KNOBBE, MARTENS, OLSON & BEAR, LLP

Dated: 6/18/02

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APPENDIX

CLAIMS ON APPEAL

22. A method of generating cw mode-locked laser pulses, comprising:

generating Q-switched mode-locked laser pulses; and

suppressing Q-switching.

23. A method as defined in Claim 22, wherein said suppressing step comprises absorbing Q-switched laser pulses.

24. A method as defined in Claim 23, wherein said absorbing step absorbs a fraction of the Q-switched pulses.

25. A method as defined in Claim 23, wherein said absorbing step comprises two photon absorption.

26. A method as defined in Claim 22, wherein said generating step comprises:

pumping a gain medium located within a laser cavity; and

absorbing optical radiation from said gain medium in a Fabry-Perot structure.

27. A method as defined in Claim 26, wherein said generating step additionally comprises resonating said optical radiation within said Fabry-Perot structure.

28. A method of generating cw mode-locked laser energy, comprising:

evolving cw modelocking from Q-switched modelocking.

33. A method of generating cw mode-locked laser pulses, comprising:

generating Q-switched mode-locked laser pulses; and

preferentially suppressing Q-switching without suppressing cw mode-locked laser pulses.

34. A method of generating cw mode-locked laser energy, comprising:

generating Q-switched mode-locked pulses.